SUN EARTH

Energy - naturally with service

INSTALLATION AND OPERATING INSTRUCTIONS

Sun Earth PV Modules
monocrystalline/polycrystalline

SiG SOLAR GROUP

MA_05_2013_V2_EN_beta

EVERY RAY OF SUNLIGHT IS A BUILDING BLOCK TO OUR FUTURE

Sun Earth Solar Power - one of the most experienced photovoltaic producers in the world takes responsibility towards the future seriously

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1 Introduction

Thank you for choosing our Sun Earth® PV modules and for the confidence you have placed in us and our products. Please read this manual carefully before installing the modules. It is absolutely necessary to make yourself familiar with the safety, installation and operating instructions.

2 Disclaimer

SiG Solar disclaims all responsibility and liability for loss, damage and costs caused by erroneous installation, improper operation and incorrect use and maintenance. SiG Solar disclaims all responsibility for infringement upon patents or other third party rights resulting from module operation. No licences are granted; neither by implication nor under any patent or patent rights. The information contained in these instructions may be considered as reliable, yet do not constitute an independent guarantee. SiG Solar reserves the right to make modifications to the product, to specifications and to the operating instructions without prior notification.

3 Norms and directives

The CE mark documents that the module meets the fundamental requirements of the following guidelines:

- IEC 61730-1 / IEC 61730-2: 2004
- EN 61730-1 / EN 61730-2: 2007
- IEC 61215: 2005
- EN 61215: 2005
- Low voltage directive (directive 2006/95/EC)

4 Rules, laws and regulations

When installing a solar power plant, all applicable state, national, European and international laws, ordinances and regulations have to be complied with.. Generally recognised technical principles apply, which are generally formulated as norms, guidelines, stipulations, provisions and the technical rules of state and national organisations, power supply companies and professional associations and committees for the respective technical discipline. It may be necessary to utilise security systems in order to comply with accident prevention requirements. These security systems are not included with the product and must be set-up at the operation site.

5 Profession and skill requirements for installers

SiG Solar requires that installation be performed only by technically qualified and authorised staff with proof of accredited training (from a state or national organisation) or with corresponding expertise.

6 Sun Earth® PV module product description

Sun Earth® PV modules generate electricity as soon as they are exposed to light, and thus electrical contacts are also energised. While one individual module will be below the safe voltage specification (50V AC or 120V DC), multiple modules connected in series or parallel could represent an increased hazard. When installing modules, please follow assembly and installation instructions of all system components. We disclaim all liability for damages resulting from non-compliance with these instructions.

7 Correct use

Sun Earth® PV modules are designed to be stationary power generators for photovoltaic power systems. Any use other than or beyond this will be considered as improper use. Improper use may result in physical and mortal hazards for users or third parties and may also impede the unit or system and other objects. The manufacturer as well as the supplier is not liable for the corresponding damage. The user assumes all risks. Proper use also includes observance of the installation and operating instructions.

Modules are dimensioned for the use in application class A:
Modules applicable for to this class can be used in systems with unrestricted access and hazardous voltages (IEC 61730: greater 50V AC; EN 61730: greater 120V DC). Modules qualified for this application class under EN IEC 61730-1 and -2 are assumed to meet the specifications of Protection Class II. Efficient and safe operation of the modules requires proper transportation, storage, set-up and installation as well as careful operation and maintenance. During operation certain components are electrically active. Contact with these parts can lead to grave physical injury or death.

It is imperative to observe the following handling instructions in order to minimise the risk of physical and mortal danger.

8 Explanation of symbols used

Caution!
Hazard to body, life, environment or product

Danger!
Hazard to body and life due to electrical shock

9 General information, hazards and safety information

Do not place any electricity conducting components into plugs and sockets!
Tools and work environment must be dry.
Do not use damaged modules.
Do not disassemble modules.
Do not apply paint or adhesives to the back sheet.
Do not use sharp objects.
Never separate the solar generator from the inverter while it is grid connected.

Make sure to comply with the time intervals stipulated by the manufacturer after turning off the inverter and prior to beginning further work!

The PV module must not come close to open flames nor be mounted in the vicinity of flammable materials. It is not permissible to install the module in an environment that is chemically or biologically aggressive or corrosive.

Due to the development of aggressive ammonia, the utilisation on top of livestock barns is only permissible with a written approval from SiG Solar. The solar cables and connectors must not be installed insides stalls or with direct exposure to ammonia gas.

Transport damage!
After the modules are delivered, they must be checked immediately for transport damag. Any damage found has to be noted on the delivery slip, described in details and documented with photos.

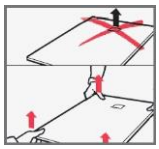
Storage!
The modules must be stored safely and protected against external influences such as humidity, light, shock, etc.

10 General information on handling

Do not disassemble the module or allow it to fall down!

Do not bend the module!

Carry with both hands! Do not lift on the junktion boxes!

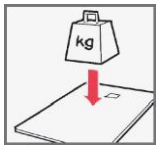


Keep all contacts dry and clean!

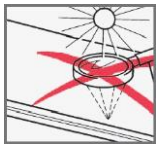
Do not step on the module or apply improper weight to it!

Do not work on the module using pointy or sharp objects!

Observe the maximum load of the glass!



Do not use mirrors or lenses to concentrate sunlight on the modules!



11 Mounting

Figure 1 and Figure 2 illustrate the position of the modules on the sub-structure (profiles). When installing the modules, make sure that the module edge with the junction box is on top. A lateral mounting with the long module edge on bottom respectively on top is valid too considering all other points in this manual.

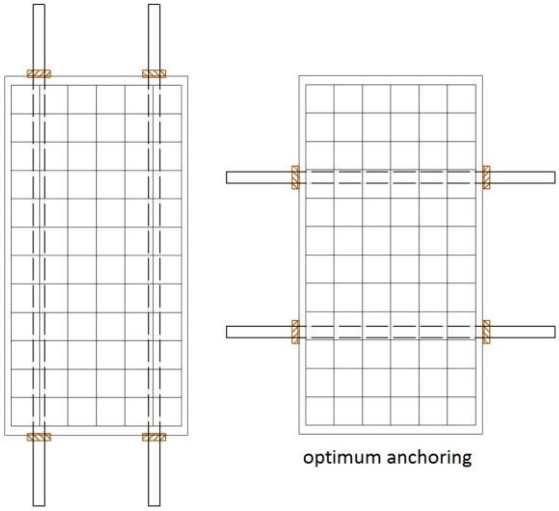


Figure 1: Installation with appropriate clamps

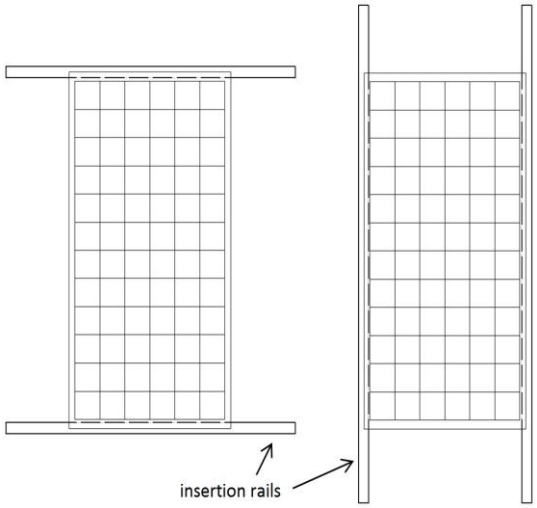


Figure 2: Installation in an appropriate insertion system

Sun Earth modules can be anchored along the long frame sides as well as on the short frame sides using form-fit clamps (see Figure 3). The maximum load refers to the insertion system as well as to the installation using clamps. When using clamps on the short or on the long side of the module, the module may only be loaded with a max. front load of up to 5400 Pa and a max. back load of up to 2400 Pa.

The maximum permissible torque on bolt M8 for the clamp is 16 Nm. The clamps must be applied within the compulsory clamping areas. The valid clamping areas of the modules are shown in Figure 6 to Figure 10 in Apendix 17.3. When placing the clamps, make sure that distances are symmetric. When clamping on the short side, clamps with a width of 100 mm have to be used. When using clamps, make sure the modules are not damaged or deformed. Clamps must not touch the glass surface and/or shade the PV cells. When using other clamping systems, please consult the company SiG Solar.

Note: TPB 156x156-72-P modules must only be clamped on the long side (see Figure 10).

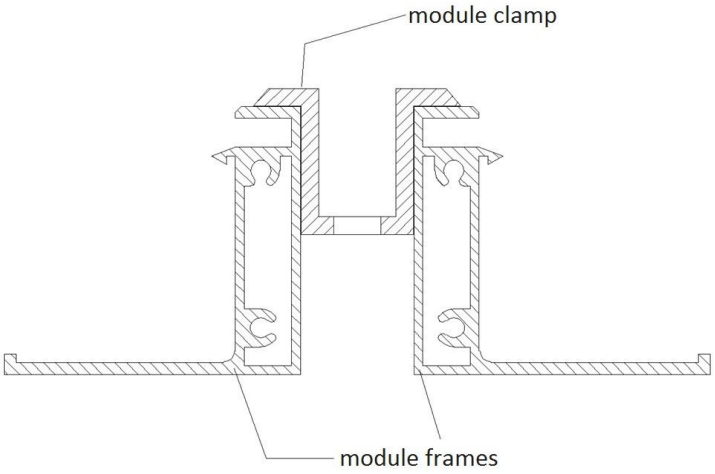


Figure 3: Positioning of the module clamp between the module frames

The sub-structure used and its connection to the roof or ground must be sufficiently dimensioned for the expected snow and wind loads. The load on the module expected to be caused by snow and wind must not exceed the module's permissible capacity.

The sub-structure must be designed in such a way that the modules are sufficiently ventilated that enough air can circulate around the back of the module in order to avoid output losses and structural damage. It is recommended to have a clearance of at least 100 mm between the rooftop and the module frame.

When mounting the modules a minimum distance between the modules of at least 5 mm is required.

Do not damage the module's surface in any way.

Do not drill any additional holes into the frame and/or other parts of the module.

12 Installation and wiring

When installing modules appropriate precautionary measures must be undertaken because connectors may be live/electrically active/energised!

Wiring must be realised in accordance with currently applicable rules.

Observe the electrical rating data for all operating materials used in the system. In addition to a junction box with integrated bypass diodes, the module is also equipped with MC-T4 compatible plugs and sockets. Plug connections must be fully inserted and locked.

Make sure that cables and connection sockets are not subjected to heavy tension. Damage to a cable or a cable inlet will destroy the protective insulation. This represents a higher risk for electrical problems.

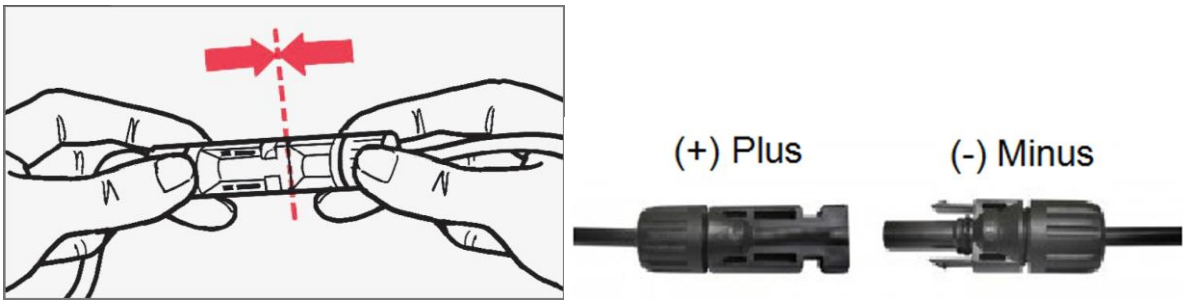


Figure 4: MCT4-compatible plug and socket

Use only MC-T4 compatible plugs and special solar cables for extending the module connection. They should meet electrical requirements based on the PV modules' connection.

Under general conditions, a PV module can deliver a current and/or voltage higher than that indicated under standardized test conditions. In order to determine the voltage values of components/voltage ratings of components, the current values of conductors/conductor ampacities, the fuse size and the size of control systems connected to the module output, the values of I_{SC} and U_{OC} indicated on the module should be multiplied by a factor of 1.25.

When connected in series, make sure that the maximum system voltage is not exceeded. For parallel connection adhere to the maximum permissible current for the system components. Pay also attention to the electrical reference data for your inverter.

In order to reduce indirect lightning strikes, keep the area of conductor loops as slow as possible when laying string lines. It is recommended to connect each module string with corresponding DC fuses.

Electrical connection to a central building management system must only be performed by certified electricians.

Never unplug or plug in the plug connection during operation.

13 Grounding and potential equalisation

Module frame and mounting systems must be connected with potential equalisation pursuant to regional and national norms and rules.

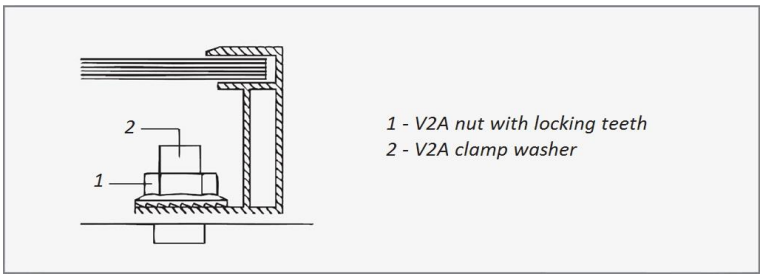


Figure 5: Installation example for potential equalisation

When using a nut with locking teeth, the module frame is conductively connected with the metal sub-structure. Establish a potential equalisation in the metal sub-structure!

Connect lightning and surge protection equipment if applicable. If a building has a lightning protection system, the photovoltaic system must be implemented into the lightning protection concept by an expert.

Grounding connections must be made in the corresponding grounding frame holes. Please make sure to follow the statutory requirements applicable to your country and region. Follow the recommendations from the inverter manufacturer and the insurance provider.

14 Regular inspections

- Check all plug connection lines and plug connectors for mechanical integrity and corrosion.
- Check the earth resistance of the entire system pursuant to regional regulations.
- Avoid contamination of the modules.
- Check the state of the mounting system.
- When performing routine maintenance on a module, grounding must not be interrupted or broken!

15 Troubleshooting and maintenance

Blocking and bypass diodes
So-called hot-spots can arise when a module is partially covered by shade. This can lead to high voltages and damage to cells and modules. Bypass diodes installed in the modules prevent that effect. Defective diodes can be replaced but just through technical personnel authorised solely by SiG Solar.

Locking diodes can prevent the current flow from a battery to the modules installed in off-grid plants when these are not producing electricity. Locking diodes are recommended especially when no charge controller is being used. For detailed information regarding the handling of charge controllers please contact the charge controller's manufacturer.

Troubleshooting
Prior to use, check all electrical and electronic components of the photovoltaic system. For information on the values to be measured, please refer to the current data sheets of the module. Follow the installation instructions of the individual components.

Use a digital multimeter to check the open-circuit voltage on each module. The value measured should coincide with the given value in the date sheet.

Also use a digital multimeter to check the short-circuit current of each module and each string. Ensure that the measurement range on the measuring devices shows 1.25 times the short-circuit current under standard conditions (STC).

Maintenance
SiG Solar recommends the following maintenance and service guidelines to guarantee optimum module performance:

If there is a marginal roof slope (< 20°) in a dusty location, it may be advisable to clean the modules after a certain time. Cleaning must not be performed under direct sun radiation or at module temperatures of >80°C. Do not use calciferous tap water for cleaning. Chalk residues may remain on the modules. Do not step on the module! Please consult a competent specialist to solve any potential problems.

CAUTION[1]: Always follow the maintenance information for all components used on the system.

16 Disposal

Under no circumstances should the modules be placed in domestic waste. We as SiG Solar GmbH and exclusive Sun Earth partner hereby declare that Sun Earth Solar Power Ltd. is a member of the organisation PV CYCLE. That means it is possible to dispose of Sun Earth® PV modules free of charge according the guidelines of PV CYCLE. Further information can be found at www.pvcycle.org.

[1] Make sure to follow all maintenance information for all components, such as the sub-structure, inverter, PV modules, etc.

17 Appendix

17.1 Sun Earth® PV module family[2] (monocrystalline)

Module type	TDB 125x125-72-P	TDB 125x125-96-P
Module power class	**190 Wp / 195 Wp / 200 Wp**	**250 Wp / 260 Wp**
General		
Composition	72 (125x125 mm) monocrystalline silicon solar cells per module; 3 bypass-diods; encapsulant EVA; rear cover TPT	96 (125x125 mm) monocrystalline silicon solar cells per module; 4 bypass-diods; encapsulant EVA; rear cover TPT
Glass	highly transparent, anti-reflective solar safety glass; 3,2 mm	highly transparent, anti-reflective solar safety glass; 3,2 mm
Frame	anodised aluminum	anodised aluminum
Connection		
Junction Box	plastic; IP65	plastic; IP65
Cable	4 mm^2; 900 mm	4 mm^2; 1000 mm
Conectors	MC-T4 compatible	MC-T4 compatible
Mechanical Data		
Height [in mm]	1580x808x46	1596x1065x46
Weight [in kg]	16	20,5
Electrical data (STC)[3]		
Max. power (P_{mpp}) [in W]	190 / 195 / 200	250 / 260
Max. voltage (U_{mpp}) [in V]	36,6 / 36,8 / 37,0	48,6 / 49,0
Max. current (I_{mpp}) [in A]	5,20 / 5,30 / 5,41	5,15 / 5,31
Open-circuit voltage (U_{oc}) [in V]	45,0/ 45,2 / 45,4	59,8 / 60,2
Short-circuit current (I_{SC}) [in A]	5,42 / 5,49 / 5,56	5,38 / 5,48
Electrical data (general)		
Cell temperature (T_{NOCT}) [in °C]	46	46
Module efficiency [in %]	14,9 / 15,3 / 15,7	14,7 / 15,3
Tollerance of performance [in W]	-0 W bis +5 W	-0 W bis +10 W
Temperature coefficients		
Power [in %/°C]	-0,45	-0,45
Open-circuit voltage [in %/°C]	-0,32	-0,32
Short-circuit current [in %/°C]	0,05	0,05
Limit values		
Max. system voltage (IEC) [in VDC]	1000	1000
Max. reverse current I_R [in A]	10	10
Operating temerature (environment) [in °C]	-40 bis +85	-40 bis +85
Max. hail resistance	25 mm at 23 m/s	25 mm at 23 m/s
Max. wind resistance [in Pa]	2400	2400
Max. snow load (front) [in Pa]	5400	5400
Application class	A	A
Fire resistance class	C	C
Safety class	II	II

[2] Status: April 2013.

[3] STC irradiance: 1000 W/m^2; AM: 1,5; TC: 25°C | NOCT irradiance: 800 W/m^2; TA: 20°C; wind speed: 1m/s
[Average reduction of the module efficiency at decreasing irradiance from 1000 W/m^2 to 200 W/m^2 (at AM: 1,5 & TC: 25°C): ≤ 4,5% - according to EN 60904-1]

17.2 Sun Earth® PV module family[4] (polycrystalline)

Module type	TPB 156x156-54-P	TPB 156x156-60-P	TPB 156x156-72-P
Module power class	**220 Wp**	**235 Wp / 240 Wp / 245 Wp / 250 Wp**	**285 Wp / 295 Wp**
General			
Composition	54 (156x156mm) polycrystalline silicon solar cells per module; 3 bypass-diods; encapsulant EVA; rear cover TPT	60 (156x156mm) polycrystalline silicon solar cells per module; 3 bypass-diods; encapsulant EVA; rear cover TPT	72 (156x156 mm) polycrystalline silicon solar cells per module; 3 bypass-diods; encapsulant EVA; rear cover TPT
Glass	highly transparent, anti-reflective solar safety glass; 3,2 mm	highly transparent, anti-reflective solar safety glass; 3,2 mm	highly transparent, anti-reflective solar safety glass; 3,2 mm
Frame	anodized aluminum	anodized aluminum	anodized aluminum
Connection			
Junction Box	plastic; IP64	plastic; IP65	plastic; IP66
Cable	3 mm²; 800 mm	4 mm²; 1000 mm	4 mm²; 1200 mm
Conectors	MC-T4 compatible	MC-T4 compatible	MC-T4 compatible
Mechanical Data			
Height x Width x Thickness [each in mm]	1482x992x40	1642x992x40	1958x992x46
Weight [in kg]	17,5	19	23,5
Electrical data (STC)[5]			
Max. power (P_{mpp}) [in W]	220	235 / 240 / 245 / 250	285 / 295
Max. voltage (U_{mpp}) [in V]	26,5	29,2 / 29,3 / 29,4 / 29,5	35,1 / 35,3
Max. current (I_{mpp}) [in A]	8,30	8,05 / 8,19 / 8,34 / 8,47	8,12 / 8,36
Open-circuit voltage (U_{oc}) [in V]	33,2	36,7 / 36,8 / 36,9 / 37,0	44,1 / 44,3
Short-circuit current (I_{SC}) [in A]	8,65	8,47 / 8,58 / 8,68 / 8,78	8,51 / 8,67
Electrical data (general)			
Cell temperature (T_{NOCT}) [in °C]	46	46	46
Module efficiency [in %]	15,0	14,4 / 14,7 / 15 / 15,3	14,7 / 15,2
Tollerance of performance [in W]	-0 W bis +5 W	-0 W up to +5 W	-0 W up to +5 W
Temperature coefficients			
Power [in %/°C]	-0,45	-0,45	-0,45
Open-circuit voltage [in %/°C]	-0,32	-0,32	-0,32
Short-circuit current [in %/°C]	0,05	0,05	0,05
Limit values			
Max. system voltage (IEC) [in VDC]	1000	1000	1000
Max. reverse current I_R [in A]	16	16	16
Operating temerature (environment) [in °C]	-40 at +85	-40 bis +85	-40 at +85
Max. hail resistance	25 mm at 23 m/s	25 mm at 23 m/s	25 mm at 23 m/s
Max. wind resistance [in Pa]	2400	2400	2400
Max. snow load (front) [in Pa]	5400	5400	5400
Application class	A	A	A
Fire resistance class	C	C	C
Safety class	II	II	II

[4] Status: April 2013.

[5] STC irradiation: 1000 W/m²; AM: 1,5; TC: 25°C | NOCT irradiation: 800 W/m²; TA: 20°C; wind speed: 1m/s
[Average reduction of the module efficiency at decreasing irradiation from 1000 W/m² to 200 W/m² (at AM: 1,5 & TC: 25°C): ≤ 4,5% - according to EN 60904-1]

17.3 Dimensions and clamping areas[6]

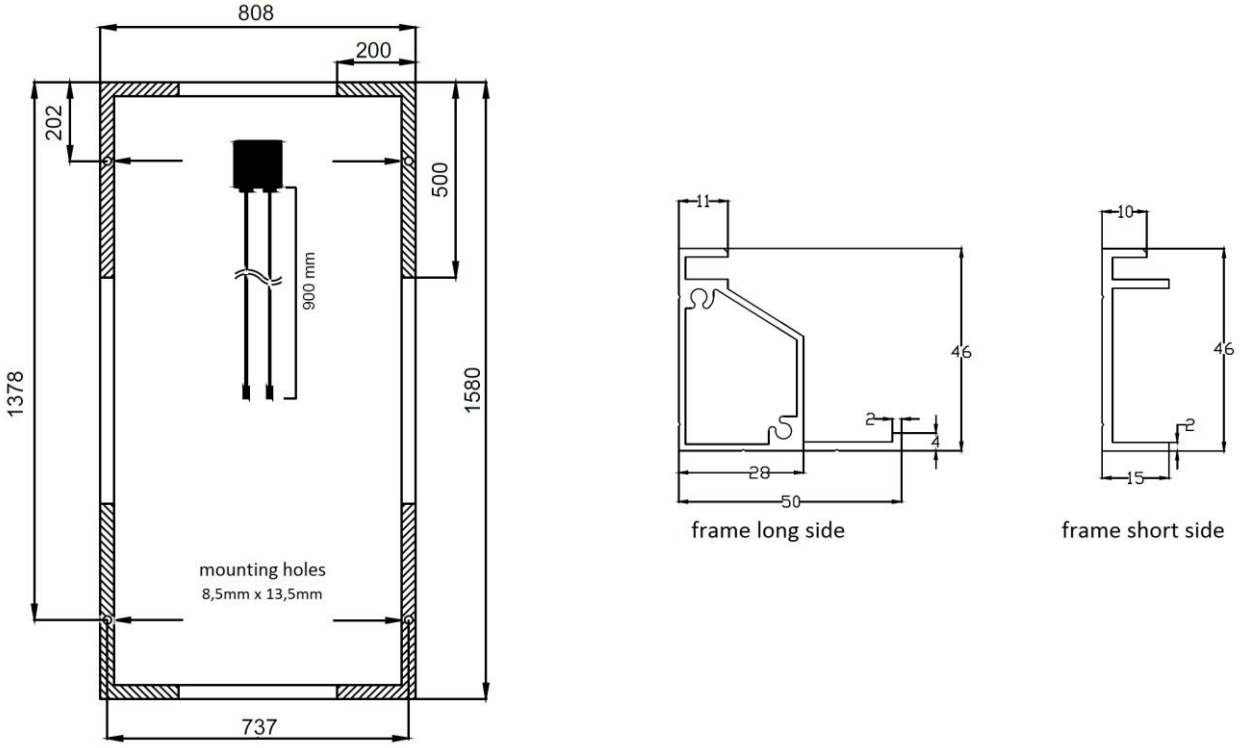


Figure 6: Dimensions and clamping areas for TDB 125x125-72-P

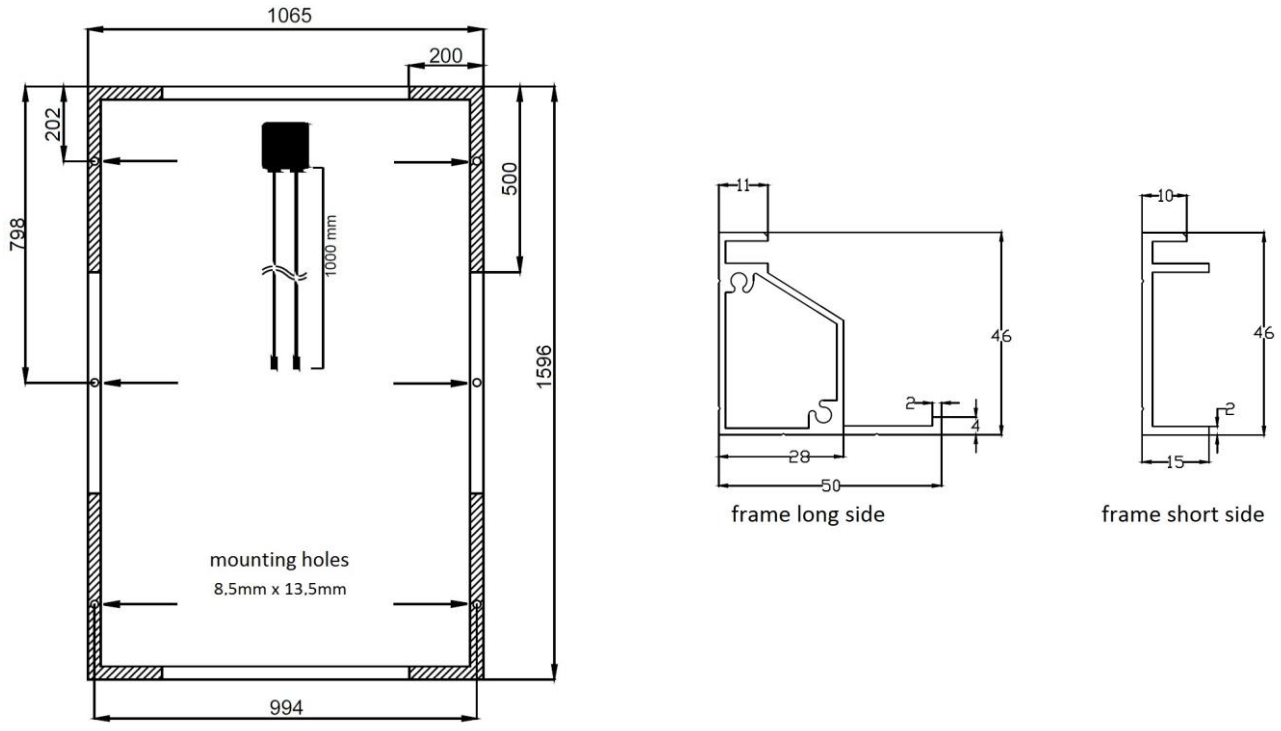


Figure 7: Dimensions and clamping areas for TDB 125x125-96-P

[6] all frame dimensions with a tolerance of ±3 mm

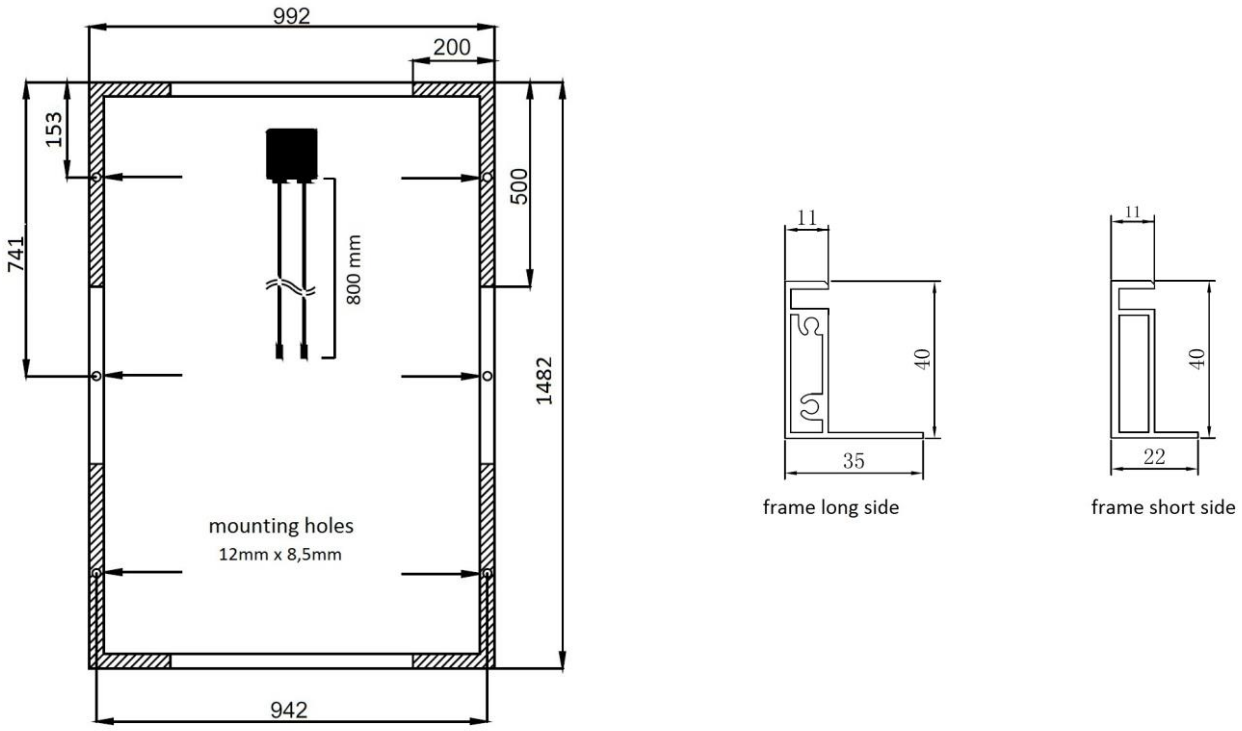


Figure 8: Dimensions and clamping areas for TPB 156x156-54-P

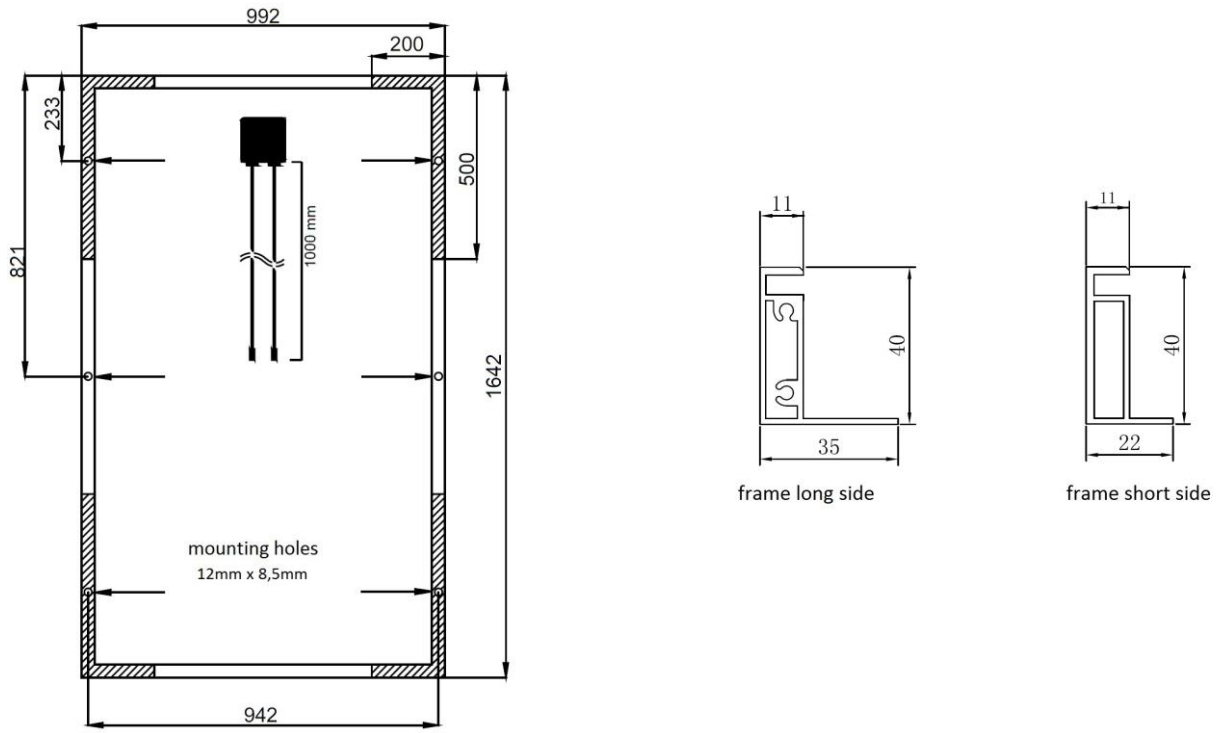


Figure 9: Dimensions and clamping areas for TPB 156x156-60-P

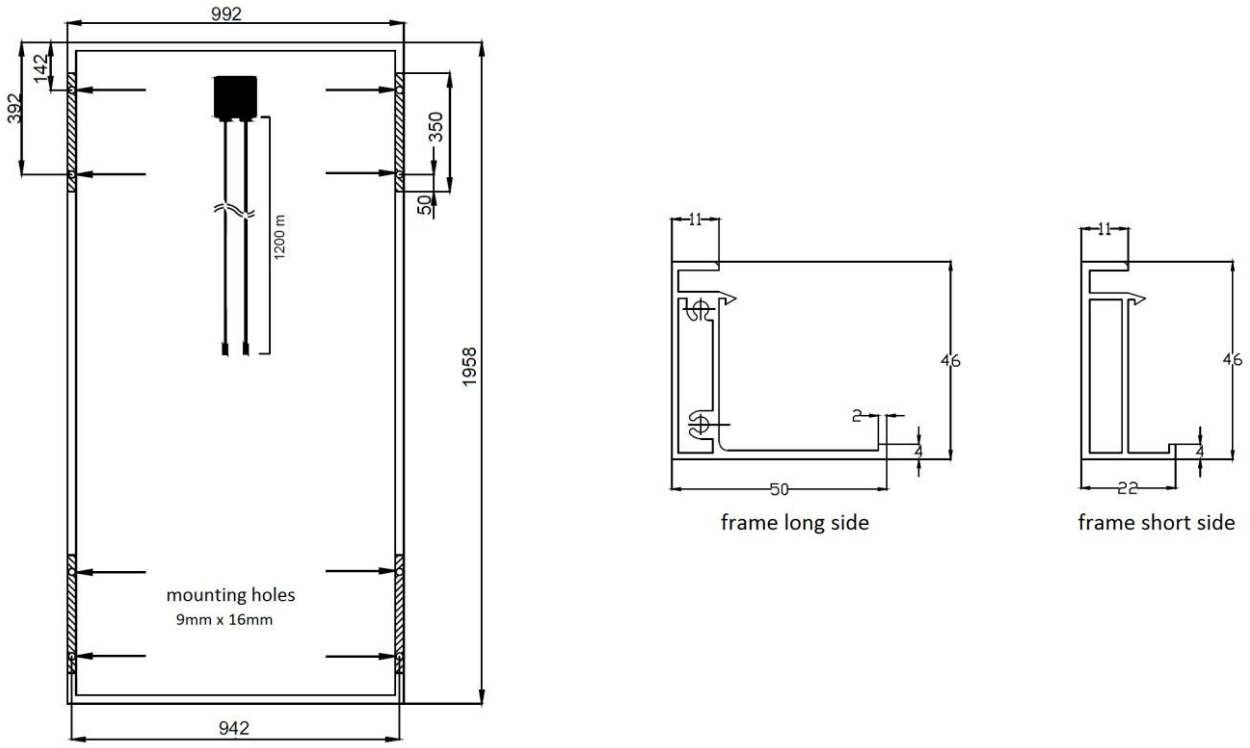


Figure 10: Dimensions and clamping areas for TPB 156x156-72-P

17.4 Declaration of Conformity I

EC Declaration of Conformity

SiG Solar GmbH, Ernst Abbe Str. 6, 28816 Stuhr, Germany, hereby declares on the basis of TÜV Rheinland certificates that the standard modules:

TDB 125x125-72-P (155-200 Wp)
TPB 156x156-54-P (180-225 Wp)
TPB 156x156-60-P (200-250 Wp)
TPB 156x156-72-P (235-300 Wp)

meet the requirements of the norms:

IEC 61730-1 / IEC 61730-2: 2004
EN 61730-1 / EN 61730-2: 2007
IEC 61215: 2005
EN 61215: 2005

and therefore also comply with EC directive 2006/95/EC
"Directive of the Council on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits".

Stuhr, 01. January 2013

Jan-Christian Schröder
Geschäftsführer / General Manager

17.5 Declaration of Conformity II

EC Declaration of Conformity

SiG Solar GmbH, Ernst Abbe Str. 6, 28816 Stuhr, Germany, hereby declares on the basis of VDE-certificates that the standard modules:

TDB 125x125-72-P (220-270 Wp)

meet the requirements of the norms:

DIN EN 61215 (VDE 0126-31):2006-02; EN 61215:2005-08
DIN EN 61730-1 (VDE 0126 Teil 30-1):2007-10; EN 61730-1:2007-05
DIN EN 61730-2 (VDE 0126 Teil 30-2):2007-10; EN 61730-2:2007-05
IEC 61215(ed.2)
IEC 61730-1(ed.1)
IEC 61730-2(ed.1)

and therefore also comply with EC directive 2006/95/EC
"Directive of the Council on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits".

Stuhr, 01. Januar 2013

Jan-Christian Schröder
Geschäftsführer / General Manager

THOSE WHO ONLY GRUB INTO THE EARTH WILL NEVER SEE THE SKY

Chinese saying

Build on the eternal power of the sun with Sun Earth

SUN EARTH

Energy - naturally with service

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